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EDITORIAL NOTES—MARCH, 1920.

The attention of persons interested in the importation of animals is called to the Order in Council made on 20th February, under the Foreign Animals Importation Ordinance 1886. Particular attention should be given to the requirements as to the statutory declaration to be made by the shipper of either domesticated or undomesticated animals, on which declaration in the case of the former, there must be a certificate of a veterinary officer. In the case of undomesticated animals, a permit must first be obtained from the Superintendent of Agriculture. Much inconvenience, and perhaps loss too, may be avoided, if intending importers will instruct their shipping agents as to the requirements of the law, The restrictions imposed are made to guard against the introduction of diseases of animals, and thus safeguard what should become a most important industry. The Order in Council referred to above is to be found on pages 150–153 of the *Royal Gazette*, No. 20 of 1920, and copies of the Order may be obtained separately from the Government Printer, Suva.

The Superintendent of Agriculture will be glad to receive information as to the time of lowest barometer reading at any place which was influenced by the recent storm and as to the direction of the wind before and after the minimum pressure.

The settlement of the strike in Australia and the running of steamers again from that country—our chief source of many supplies—has relieved much of the tension which existed in regard to some commodities. The position of the Colony, however, as regards foosdtuffs is by no means a sound one. There are strong indications that a considerable shortage of foodstuffs during the current year will be experienced. Owing to drought in Australia, the wheat crop was a very poor one. New Zealand, too, has also unfortunately had a crop insufficient for its requirements, and has to import from Australia. South Africa, too, seems to have had a bad season, and is trying to obtain supplies from Australia. In these circumstances, the rise in the price of wheat, flour, and sharps is natural, and restrictions have been placed on their export. It must be remembered that this is almost the commencement of the period to be covered by the recent crop, as the next one is not due until towards the end of the year. A country must naturally provide first for its own needs, and it may be that Fiji will find itself without even the

small amount which constitutes its requirements. In these circumstances, the extended planting of food crops seems to be desirable.

The Government has secured four tons barley-seed, which is about to be distributed, and as barley-flour is, according to information to be found elsewhere in this number, better known to the poorer classes of Indians, in India, than wheat-flour, the crop to be grown from this seed should prove most acceptable. It is hoped that this will be the beginning of an industry of some size, and that it will thus be a step in the economic advancement of the Colony by helping to replace some part of the somewhat large list of imported commodities by products of local industry.

The advantages of maize as an emergency crop are again submitted for notice. It is a crop which will grow under widely varying conditions, it is not seasonal like rice, is a much shorter crop, and provides most excellent food.

NOTES ON BARLEY.

By C. H. KNOWLES and J. P. TARBY.

INTRODUCTION.

The Government is arranging to import a quantity of barley seed for free distribution among small growers. This grain is an excellent food and should be well known to many of our small settlers. The following information taken from *Economic Products of India* (Sir G. Watt, 1908) indicates the importance of the grain in that country:—

"Barley is amongst the most ancient of cultivated foods and Theophrastus says it was an important article of food in the time of Solomon (B.C. 1015).

"The total area under barley in British India and the Native States for the year 1905-6 was 7,745,218 acres, yielding 3,167,387 tons roughly.

"In preparing the grain for food it is husked (in Dhekis or wooden mortars) and ground into course meal from which alone, or mixed with the meal of wheat or gram, *chappattis* are made and baked; or a gruel or pasty mass is made to which salt is added and the preparation eaten with garlic, onions, or chillies. In either of these forms, it is a staple article of food among the poorer classes.

"With the majority of the people of India wheat is not a necessity of life, it is indeed rarely, if ever, eaten by them."

Planters and others who have Indian tenants situated in the drier parts of this Island who are interested in the matter should consult the Manager of the Rice Mill as to the supply of seed. Barley ground into meal as mentioned above should replace part if not all of the imported sharps.

VARIETY.

The varieties to be imported are Six-row and Skinless.* In warmer climates where the grain ripens quickly the Six-row variety gives the best yield. The grain has an outer skin or husk at the extremity of which is attached a long thin spike or beard, hence it is known as a bearded variety.

The Skinless is a very distinct type without beard. It is drought-resistant and well adapted for grain production in dry districts. The grain is enveloped in thin chaff and is easily threshed, the absence of husk giving it the appearance of wheat.

TIME OF SOWING, &c.

A fair amount of rain is needed during the first two months after sowing and the crop, which takes three to four months to mature, should be reaped in a dry month.

According to the records of rainfall kept by the Department of Agriculture the most suitable months for sowing in the following districts would be:—If the rainfall during January to March has been much less than usual, sow in April for districts of Nadi, Lautoka, Ba, Tavua and Ra; and in May at Sigatoka.

* Since this was written, it has been found that Skinless Barley is not obtainable this season.

If the rainfall during January to March is normal, sow the following month, and if much more rain than the average has fallen during January to March, sow one month later still.

Of course growers will have to be guided by local conditions, since there are areas within all districts where the rainfall differs from the general fall in that district.

Preparation of Land, &c.

The most important consideration in barley growing is the condition of the soil, which latter should be so worked that it is in a mellow and a friable condition. Barley is an early ripening cereal and the root growth is short and not abundant and hence it is necessary to sow on land that is in a high state of cultivation.

Unused land and stiff soil on which rice has been grown should be ploughed 4 to 6 inches deep, harrowed and left to weather for a month, when a second ploughing is given. Very friable soil, freed from weeds or rice stubble beforehand, might be ploughed once and sown at the same time. If too friable it should be rolled after sowing.

Sticky, lumpy soil should be avoided, and in no case is wet land to be used. All land likely to become wet should be well drained. The best land is friable volcanic soil, whether on flat or on low undulating hills, and alluvial soil which is not too low or damp and not too rich, as barley soil should be only moderately rich and the crop cannot withstand a great amount of moisture in its young stages. Avoid if possible sowing lands which are fully exposed to the August and September gales.

Rate of Seed per Acre.

Two benzine tins full equal one bushel of seed which should sow one acre.

Sowing.

On no account is seed to be broadcasted, as the yield from crops so sown is invariably poor and the grain small.

Pending the introduction of proper drills for sowing, the best method to sow is to follow up the second ploughing, or first in very friable soil, and dribble the seed thinly, continuously and evenly by hand into the bottom of the furrow which should be 2 or 3 inches deep according to the amount of rainfall at the time of sowing; the furrows being 9 to 12 inches apart, according to richness of soil, the mould of each succeeding furrow being made to cover the seed dribbled in each preceeding one.

Cultivation.

Before sowing and after it, until the crop covers the ground, the land should be kept free from weeds. The greater the care taken to plough in all weeds before sowing, the less weeding there is to be done after sowing. In fact, when two careful ploughings are given (one before and the other while sowing) and quick germination follows sowing, no trouble should result from weeds before the crop covers the ground.

Should dry weather follow germination, the surface of the soil should be mulched, that is it should be loosened, at intervals, two inches deep with a hand-hoe between the rows to prevent evaporation of the water contained in the soil.

Probable Yield.

From various small experimental plots grown at Sigatoka as much as 30 to 40 bushels per acre were obtained, but, even if the yield is no more than 20 bushels per acre, the small settler should be amply repaid for his labour.

Method of working up the Crop, &c.

After the crop is matured but not too much so, as then the grain is apt to fall off the ear when being reaped, the crop, in the absence of reaping machines, is cut, hand-threshed, and the grain dried in the sun for a few days in the same manner as rice, and then bagged. Where there are no proper flour mills to grind the grain into meal or sharps, the method practiced by most householders in India, and with which most Indian men and women who come from India are acquainted, will have to be adopted. In any event it may be cheaper and more convenient to the small growers in the country to grind their own barley meal in their spare time, in the same way they husk their paddy into rice, than to send these products to central mills for treatment.

When required for use barley should be again sun-dried and then husked in a *dheki* (wooden mortar used by Indians to husk paddy) and winnowed, and the resulting husked grain is ground into meal in a hand-mill known as *chakki*. The meal so obtained is then passed through a very fine sieve 40 to 60 to the inch) to separate the bran and coarse meal from the finer or finished meal or sharps. The coarse meal containing the bran is subjected to further grinding and sifting until practically nothing but bran is left in the sieve. This bran, which contains a percentage of coarse meal, makes good feed for cattle, pigs, and poultry and should be slightly damped with water before use.

Results with Sigatoka grown barley showed that 100 lb. of threshed grain gave 16·68 lb. husk and 83·32 lb. grain, and that 83·32 lb. of husked grain gave 81·66 meal and 1·66 chaff.

It would however be better to take 80 per cent. as the yield of meal from the barley grain as obtained by threshing the ears reaped.

Request.

All growers of barley from seed distributed by the Government are requested to reserve an ample quantity of the produce for planting the following season.

Since the seed barley secured from Australia is not sufficient for every settler in the suitable districts to be provided with a supply, it is suggested that growers should distribute free of cost from their crops a quantity of seed equal to the amounts supplied to them, to persons in their neighbourhood who received no seed this year.

A REPORT OF AN INVESTIGATION OF MATTERS AFFECTING THE PRODUCTION OF CATTLE AND HORSES IN COLO EAST.

By Wakefield Rainey, Government Veterinary Officer.

The investigation was made between 14th and 31st January, 1920, and included a detailed examination of nearly all the live-stock and grazing land in the province of Colo East.

The District Commissioner Mr. A. J. Armstrong accompanied me in the course of the inspections and made the necessary arrangements to ensure that all stock were collected for examination.

It is relevant to state here that such active co-operation on the part of the District Commissioner is essential to the success of an investigation of matters affecting stock in a province where most of the proprietors of land and cattle are natives.

I would go further than this and say that in such a province, if not in all provinces in Fiji where cattle are produced, the administration of the Stock Improvement Ordinance and the like should be vested under veterinary guidance in the District Commissioner with power to act either on his own account or by deputy. It is evident to me that only by this arrangement of decentralisation will it be found practicable under existing conditions in the provinces more remote from Suva to carry out the provisions for instance of the Stock Improvement Ordinance of 1909. This point will form the subject of a special report at a later date and is only mentioned here to emphasize the value of the assistance given and to be given to me by the District Commissioner of Colo East in his lively appreciation of the pastoral possibilities of his province.

An interesting and novel feature of my investigation was the opportunity given to study the awakening capacity of the Fijian native as a stock owner. It will be seen from the itinerary which is attached as an appendix* to this report that many Fiji towns were visited for the purpose of inspecting the small herds of cattle in the communal ownership of the various towns. In some towns the cows in the herds are milked to supplement the food supply of babies, but for the most part the object is the production of beef cattle which are slaughtered for food at the building of a house or on other festive occasions. Unfortunately slaughtering is on too large and indiscriminate a scale, so that at present there is a tendency for herds to be killed out rather than to increase.

So far from there being any need to enforce the elimination of surplus bulls as required by the Stock Improvement Ordinance, I observed that among the Fijian-owned cattle in Colo East, the number of native bulls is insufficient.

It appears that to the rural Fijian communities a fat young bull of between nine and eighteen months is irresistibly tempting, when a beast has to be killed to provide a feast for a special occasion.

This fact in my opinion constitutes a serious menace to stock production, and it is not clear to me how the difficulty can be overcome unless the province undertakes the ownership of a certain number of bulls.

Most of the Fiji towns in Colo East have access to rich Para grass land far in excess of their grazing requirements and it is desirable that their herds should increase.

* Not printed.

It was observed that the care and even the milking of the cattle was undertaken by the children of the towns who consequently are likely to grow up with a better knowledge and appreciation of animals than the preceding generation, a circumstance which ultimately may become of considerable economic importance.

There was evidence that the animals are on the whole well looked after and kindly treated.

Very little effort is made to keep pigs under conditions of domestication. A notable exception, however, was observed at Delaitoga, where about twenty pigs are kept in small lots under good management. I understand that since steps have been taken for reasons of public health to ensure that pigs are only kept under hygienic conditions, the Fijians have preferred to abandon pig culture altogether rather than to build the pens and cultivate the vegetable food required for the proper control and artificial maintenance of the animals.

This is a pity, because to a limited extent pigs are a profitable asset to the community; and the animals will thrive on any starchy vegetable food. It is true that during certain periods there is very little sale for pigs in the remote rural districts, but on the other hand during times of affluence, as when a banana crop is sold, the fat pigs will command a handsome price up to £12 each (twelve pounds each). Moreover it would be a far wiser arrangement for the Fijians to kill pigs for festive occasions, since they can soon be replaced than to slaughter fine young bulls and even good milking cows as at present.

Relatively to its extent there are very few horses in the province and and those are chiefly owned by Fijians. They are small animals as a rule but of excellent quality. With a life experience of horses and riding in different parts of the world, I can safely say that I have never met with more sure-footed or hardier little animals than the ponies bred in the upper reaches of the rivers in Colo East. It is considered by local residents that the stock is degenerating and that fresh blood is required. There is no doubt that this is true. Animals fed only on grass of indifferent food value and worked from early youth must in due course degenerate from the original thoroughbred and Arab types, which evidently entered largely into the composition of their imported ancestors. It is very desirable that the province should acquire an imported stallion of the thoroughbred hunter type, if this excellent and acclimatised stock is to be kept up to a serviceable standard.

Statistics.

The number of live-stock in the province are approximately:—cattle, 1,200; horses, 100; of the cattle rather less than one-half are cows. About 400 animals are owned by Europeans, the remainder belong to Indians and Fijians.

Grazing.

The land in Colo East, considered as a whole, is either flat alluvial soil extending from the banks of rivers to a varying distance, or is hill land covered with forest and bush.

The flat lands except in banana plantations are thickly covered with Para grass of excellent quality. Here and there one sees small areas on hill sides which are intermediate between the two chief types, and on these areas the pasture may consist of native grasses with a sprinkling of a trefoil type of herbage of undoubtedly good feeding value, but with little tendency

to spread. On the whole the available Para pasture is enormously in excess of existing feeding requirements. At a rough but conservative estimate there are 10,000 acres of river bank Para, of which no use is being made, and including the area of exhausted and existing banana plantation there may be 10,000 acres more.

There is abundant evidence in Colo East of the resistance Para pasture offers to the invasion of " Koster's Curse." Where Para is not over-stocked and eaten out by cattle, " Koster's Curse " clearly cannot enter. Where over-stocking exists, the disappearance of the Para and its replacement by " Koster's Curse " and inferior grasses is only a matter of time.

I would here refer to the fact, already discovered by more than one stock owner in Fiji, but by no means generally recognised, that only by means of systematic paddocking can cattle be grazed successfully on Para pasture and the invasion of " Koster's Curse " be prevented.

For example, let it be assumed that a planter has 100 acres of Para pasture and 100 cattle to be fattened. If he runs the 100 cattle on the 100 acres of Para in one paddock the grass never gets a rest until it ultimately succumbs to the constant grazing and trampling, when it is replaced by " Koster's Curse " and Thurston grass. On the other hand if he divides his 100 acres into three or four paddocks and gives his 100 cattle a month in each paddock, with complete rest to the other paddocks during the month, his pasture will not die out and he will be able to continue his fattening operation year after year. This is no theory but the recorded observation of an existing set of facts. Para may not be an ideal grass, for horse breeding it is unsatisfactory, but I have come to regard it as the best pasture for the wet side of Fiji so long as the difficulties of labour and " Koster's Curse " exists in their present form.

An interesting exception to the majority of the land in Colo East is the calcareous or lime soil in the upper reaches of the Wainimala River, notably in the vicinity of Korovou. As might be expected this district is especially well adapted for horse-breeding. The upper reaches of the Wainibuka River are regularly free from " Koster's Curse."

Disease.

I could find no evidence of disease among cattle bred in Colo East. A few cases of tuberculosis were found among cattle that had been brought into the district from elsewhere, notably among recent arrivals by the overland route from Ra. There is no doubt further cases will occur in due course among cattle brought in for fattening in this way, and one can only seriously warn the public against bringing into a herd an animal with a persistant cough, or one showing well defined swelling at the junction of the head and neck or in the fold of skin at the junction of the hind leg with the flank.

Many apparently sound animals are arriving in the province at present on their journey through from the northern side of the island in an emaciated condition, consequently emaciation alone in these animals cannot be considered evidence of disease.

It should, however, be possible to keep these animals by themselves for a while after being put on to good land, in order to pick out those which do not begin to put on condition in reasonable time, and which consequently are emaciated on account of disease and not on account of starvation or hardship.

Definite cases of tuberculosis discovered in the course of my investigation were destroyed, and my diagnosis was confirmed by post-mortem examination in the presence of the owner or his representative.

I discovered, among horses fed from birth or over a long period solely on Para grass, the existence of a disease termed "osteoporosis."

In its mildest manifestation the presence of this disease is recognised by a bulging of the bones at the sides of the nose, so that the face is to a greater or less extent flattened or rounded at a point about midway between the level of the eyes and the nostrils. More serious symptoms are progressive stiffness or dragging of a limb, ending in the worse cases, in complete uselessness of the animal. The cause of the disease is considered to be the absence in the food of a constituent that is essential to the building up of bones.

It could be avoided in the case of horses fed chiefly on Para grass by including in the daily dietary some other form of grazing or a handful of peas or beans.

It is my intention on returning to Suva to prepare for circulation a memorandum or pamphlet dealing with this disease.

Stock Improvement Ordinance 1909.

As already stated there is no need to carry out the provisions of this Ordinance so far as cattle are concerned. The number of bulls in the province is not enough to meet existing requirements.

The standard of cattle on the whole is good; there is little evidence of degeneration.

Instructions were given for the castration of about twelve stallions. Six stallions of fair quality were approved for subsequent registration. Arrangements were made for the castration of undesirable animals for suitable fees by Mr. J. D. Browne, of Taivou, who kindly undertook to do the necessary work.

The District Commissioner undertook to enforce the Ordinance in respect of the stallions that were not approved for registration.

Reverting to the subject of bulls, my experience in Colo East strengthens my growing impression that it is unnecessary and undesirable to apply the provisions of the Stock Improvement Ordinance to cattle in Fiji unless at some future time it may be found practicable to establish a system of publicly owned stud bulls in various centres.

Trade.

The relation, given above, of the numbers of stock to the available grazing shows that the pastoral resources of Colo East are barely touched.

In company with the District Commissioner I stood at a point on the road from Vunidawa to the upper Wainimala districts, and looked out over a valley containing at least 3,000 acres of virgin Para grass where hardly a beast was grazing. This is only an instance of the possibilities. If the banana planters succumb to labour and shipping difficulties, or find in the course of development that cattle are more profitable, there will become available many more thousands of acres of flat land, which planted with Para and throwing in the adjoining hill land as an accessory, will carry a beast to the acre of flat.

It may be regarded as a step in the right direction to find that there is a growing tendency in Fiji to divide the labour of cattle production into

breeding and fattening. As a rule it is not a good arrangement for a man with moderate capital and limited acres to attempt both to breed and to fatten. The combined business requires a great amount of fencing and labour to keep the various catagories of animals properly separated and cared for in every way.

It is far better to split up the business into those of breeder and grazier. The drier side of the island is apparently not as suitable for fattening as the alluvial flats of Colo East and Rewa, consequently it may be reasonable to assume that breeding should be carried out chiefly in the north and grazing in the south.

I have not yet seen the north side of the island; my assumption is based on the evidence afforded to me by the condition of the cattle that are constantly coming through from Nadi, Ba, and Ra.

In Ireland, the pioneer country of the grazier, very few men attempt both to breed and fatten.

The present outlet for fat bullocks in Colo East is by sale to the local butcheries and to the butchers at Suva and by slaughter for Fijian festivals.

It is more than sufficient for present supplies, but it would of course be absurdly inadequate for a properly developed grazing industry.

About four bullocks weekly are killed at two butcheries at Vunidawa, and the flesh is readily sold at the following varying prices:—9d. per lb., without bone or allowing for bone; 6d. per lb., with bone. Fat cattle are bought by the butchers on the hoof "by hand," that is to say at so much a beast without reference to weights. Prices paid vary between £6 and £12 a beast according to size and quality.

Prime beef of the first grade can be produced in Colo East; I saw beasts that would kill out at over 900 lbs., for such a beast the butchers would pay £12. The average price paid is probably about £8 for a 600 lbs. beast or nearly 30s. per cwt. This may be as much as the butcheries organised in rough and ready fashion can afford to pay at the present retail prices of meat.

It is of no avail to contemplate cattle production on a large scale on the Wainimala, Wainibuka, and Rewa Rivers until a sufficient outlet for prime cattle is provided. In the absence of such an outlet, whether a canning factory in Fiji or an export trade to Australia, the local markets would soon be glutted if a serious attempt were made to develop the grazing possibilities of this province.

There is, however, an immediate and profitable opening ready for a grazier or two able to spend money on fencing, prepared to conduct the business on a scientific basis, and to supply up to ten *prime* bullocks weekly at a average price of about £12 to the butcheries of Vunidawa and Suva.

Suitable stores apparently can be bought on the northern side of the island at about £5 each, which after six months or less grazing on good Para land should realise the price mentioned.

The butchers at Vunidawa are hard put to it to obtain their four fat beasts weekly, and no doubt would welcome a steady guaranteed supply of prime bullocks.

The butchery under the management of the local representatives of Messrs. Brodziak's, recently paid a local planter £47 10s. for four prime bullocks, and I have no doubt that for animals of equal bulk and condition as good a price could be obtained in Suva.

It would be necessary for the grazier personally to go over to the northern side to buy his stores and to drive them through by the overland route.

The Fijian native is rapidly becoming a buyer of meat and the tendency will steadily increase as it does increase everywhere in the progress of civilisation.

It is a matter of common observation all over the world that with improved industrial circumstances the workers tend to spend more money on meat, and this fact has no doubt much to do with the better markets in Australia; where Fiji is naturally adapted to compete and where she must some day compete if the business of cattle production is ever to be of real importance to the Colony.

In considering the causes of the slow development of the beef industry in Fiji, it is necessary to remember that the labour basis is Indian. For this reason alone the industry is severely handicapped in comparison with other Colonies, where the industrial workers are not debarred for religious or other reasons from eating beef.

Local European opinion in Colo East is pessimistic in the matter of fencing. It is alleged that no fences can hold out against the periodic floods which submerge the river flats and deposit on the pastures the rich silt that makes them so productive. It is my opinion that this difficulty may be over-estimated or that it may be overcome. It is at least certain that no satisfactory permanent use can be made of Para pastures unless the land is divided by fences into a sufficient number of paddocks.

NOTES ON THE REMOVAL OF MOISTURE FROM COCONUT KERNEL BY WARM AIR.

By C. H. Knowles.

Taking average coconut kernel as containing 46 per cent. of water, 1 ton of kernel would give 1,273 lb. of copra containing 5 per cent. moisture, and it would require 3,941 lb of kernel to give 1 ton of copra containing 5 per cent. of moisture. As the temperature of air rises it requires more and more water vapour to saturate it.

The following table shows the amounts of water which air at various temperatures is capable of absorbing in order to become saturated:—

Temperature °F.	*Weight of water to saturate* 1,000 *c. ft.*
70	1·14 lb
80	1·54 ,,
90	2·03 ,,
100	2·73 ,,
130	6·07 ,,
141	8·28 ,,
157	12·15 ,,
170	16·07 ,,
179	19·71 ,,
212	37·84 ,,

Suppose the air used in a drying chamber enters the furnace tubes at 80° F. and is heated to 170° F. At certain times of the year the atmosphere is nearly saturated with water vapour and, for the purpose of this calculation, it is assumed that the air is actually saturated at the lower temperature.

Each 1,000 cubic feet, when heated to 170° F. can therefore take up 16·07–1·54 = 14·53 lb. As however air would take an appreciable time to absorb the moisture, and remembering that the rate at which coconut kernel will dry depends upon the rate at which the moisture in the inner layers of the kernel pass to the outside where it can evaporate, it is certain that the air in a dryer would never leave the drying chamber in a saturated condition, the nearest approach being immediately after the introduction of a new charge of fresh kernel. It is thought that the average amount of moisture in the air passing out of the drying chamber would not exceed 10 per cent. of the amount required to saturate it. For the purpose of the following calculation, assuming that only 7½ per cent. of the amount of moisture that the air could take away is actually absorbed, the weight of water removed from the charge of kernel by each 1,000 cubic feet of warm air passing over it is taken as 1·09 lb.

To remove the 1,701 lb of water to give 1 ton of copra will therefore require $\frac{1701}{1·09}$ thousand cubic feet of air and to remove the 967 lb water from 1 ton of kernel will require $\frac{967}{1·09}$ thousand cubic feet of air, or 1,561,000 cubic feet to produce 1 ton of copra and 887,000 cubic feet to produce copra from 1 ton of kernel. If the drying chamber is to be charged daily it will suffice if the drying is completed in 22–23 hours; with 22 hours it will require, say 71,000 cubic feet per hour to produce 1 ton of copra, and say 40,000 cubic feet per hour to produce copra from 1 ton of kernel.

Molesworth gives a formula for the flow of air in flues for warming by hot air:—

$$C = 480 \times A \sqrt{\frac{H\ (P-t)}{461 + t}}$$ where C=cubic feet of air per min.

A=sectional area of flue in square feet.
H=height of flue in feet.
P=temperature in flue.
t=temperature of atmosphere.

With a flue 1 square foot area 25 feet long, a temperature 170° F. inside the chamber and 80° outside,

C=98 cubic feet per min. or say 58,000 cubic feet per hour.

Molesworth reduces this by $\frac{1}{4}$, but to allow for interference and friction inside the chambers, furnace tubes, &c., it might be reduced by $\frac{1}{2}$, or say 29,000 cubic feet per hour. Hence one 25 feet flue of 2 square feet area should be ample to create sufficient "draught" to dry 1 ton of kernel in 22 hours and a 25 feet flue of 3 square feet cross section should suffice to produce 1 ton of copra in 22 hours, with temperature in the drying chamber of 170° F. and 80° F. outside.

THE FORCE OF THE WIND.

There appears to be some doubt as to the value and accuracy of personal estimations of the force of the wind during or before a storm. The following information is taken from an official publication* of the Meteorological Office, London, and should be of use to both observers and critics.

SPECIFICATION OF THE BEAUFORT SCALE WITH PROBABLE EQUIVALENTS OF THE NUMBERS OF THE SCALE.

Beaufort No.	Description of wind.	Mode of estimating aboard sailing boats.	For coast use.	For use on land.	Miles per hour
0	.....	.....	Calm.	Calm. Smoke rises vertically.	0
1	Light breeze	Sufficient wind for working ships.	Fishing smacks just have steerage way.	Direction of wind shown by smoke, but not by wind vanes.	2
2			Wind fills sails of smacks, which then move at 1–2 miles per hour.	Wind felt on the face; leaves rustle; ordinary vane moved by wind.	5
3			Smacks begin to careen and travel about 3–4 miles per hour.	Leaves and small twigs in constant motion; wind extends light flag.	10
4	Moderate breeze	Forces most advantageous for sailing with leading wind and all sails drawing.	Good working breeze: smacks carry all canvas with good list.	Raises dust and loose paper; small branches are moved.	15
5			Smacks shorten sail.	Small trees in leaf begin to sway; wavelets form on inland waters.	21
6	Strong wind	Reduction of sail necessary with leading wind.	Smacks have double reef in main sail; care required when fishing.	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	27
7			Smacks remain in harbour; and those at sea lie to.	Whole trees in motion; inconvenience felt when walking against wind.	35
8	Gale forces.	Considerable reduction of sail necessary even with wind quartering.	All smacks make for harbour if near.	Breaks twigs off trees; generally impedes progress.	42
9			.....	Slight structural damage occurs (chimney pots and slates removed).	50
10	Storm forces.	Close reefed sail running, or hove to under storm sail.	.....	Seldom experienced inland; trees uprooted; considerable structural damage occurs.	59
11			.....	Very rarely experienced; accompanied by widespread damage.	68
12	Hurricane.	No sail can stand, even when running.	.....	.....	above 75

* No. 162. "Hints to Meteorological Observers in Tropical Africa." Meteorological Office, London, 1907.

"It will be noticed that the criteria referred to depend in many cases rather on the effects which the observer perceives on objects round him than on his own physical sensations. By adopting this method an estimate of wind force may be obtained which is to some extent independent of the observer's actual position. The latter may be comparatively sheltered, but it should be such as to command a good view of a number of objects, by the behaviour of which wind force can be estimated.

"Difficulties of exposure frequently render a good estimate of wind force preferable to a measurement with an anemometer. The latter can only record the speed of that portion of the air which passes it and unless its exposure is entirely satisfactory this may differ greatly from the general speed of the air passing over the surrounding country."

The publication suggests the following table as expressing the relation between the Beaufort numbers and the corresponding hourly velocity of the wind sufficiently for ordinary use.

Beaufort number.	*Wind.*	*Limits of hourly velocity in miles per hour.*
0	Calm	Under 2
1–3	Light breeze	2–12
4–5	Moderate wind	13–23
6–7	Strong wind	24–37
8–9	Gale	38–55
10–11	Storm	56–75
12	Hurricane	Above 75

EXTRACTS FROM REPORTS OF INSPECTORS.

Coconut Scale (*Aspidiotus species*).

Mr. M. A. Forsyth, during the month, has visited practically all the villages on Ovalau, in addition to Moturiki and Wakaya. The work done on the whole is satisfactory. Villages from Levuka to Rukuruku on the east coast have very little scale, and the work ordered on his previous visit has been carried out. In most cases, few trees were found to be infected and their treatment ordered. At Viro, trees already drastically treated were found to be reinfected, and the scale is still very bad there. Naidau which received very methodical treatment looks fairly well, and very few trees have been reinfected. At Bureta and Moturiki there is still a lot of work to be done, but it is proceeding. The natives were excused several days house building duties to enable them to carry out treatment for coconut scale. Mr. Forsyth now finds the natives ready to carry out definite orders, which are issued during every visit.

At Wakaya, Mr. King has a special gang under an experienced overseer dealing with coconut scale and has accomplished a good deal towards its eradication.

Mr. Forsyth mentions the popular belief that a " good blow " will dispose of scale on plants like the coconut, and reports observing in one or two instances that leaves certainly appeared to have been cleared of the scale by rain and high wind. The recent storm offers a favourable opportunity for further observation, which will be made from time to time and reported in these notes. Mr. Forsyth reports little damage to crops on Ovalau from the storm which was felt more severely to the east of the island.

EXPORT OF FRUIT.

Owing to the absence of Captain Faddy on military duties, the inspection of fruit by the s.s. " Navua " and s.s. " Katoa," for Auckland on 19th February, was carried out by Mr. F. W. Hennings, who obtained leave from his military duties for the purpose, assisted by Mr. J. P. Tarby. The report on the shipment is as below:—

The shipment by the s.s. " Navua," consisted of 15,320 bunches of bananas. Rejection at the ships' side amounted to 9·3 per cent. of the cargo, an amount which is much larger than the average, and it is accounted for by the fact that having no Australian steamers to ship by, there was a very plentiful supply of fruit and much of it was naturally on the full side.

The holds were in order, cases well stowed and battened, and the proper number of wind-sail ventilation holes were provided.

The s.s. " Katoa " sailed a few hours after the s.s. " Navua," taking a small shipment of surplus fruit consisting of 1,352 cases of bananas. Much of the fruit had previously been inspected at the s.s. " Navua," hence the rejections were few, amounting to only 0·6 per cent. of the shipment. The fruit was of the same quality as for the s.s. " Navua."

INSPECTION OF VESSELS.

During the month of February, the following vessels were inspected under the Diseases of Plants Ordinance Regulations:—

Port.	*No. of vessels inspected.*	*Cases in which material was destroyed.*
Suva	4	2
Levuka	49	19
Lautoka	13	—

CENSUS OF STOCK.

The receipt of Returns of Stock is hereby acknowledged from the following:

Mr. C. C. Hutchings, Rewa.
Estate of the late C. C. F. Koster, Waimanu.
Mr. A. H. Witherow, Rewa.
Mrs. J. P. Whiteford, Rewa.
The Public Trustee (St. Heliers Estate, Taveuni).
Mr. J. McConnell, Taveuni.
Mr. Arthur McConnell, Taveuni.
Mr. G. Garrick, Taveuni.
Messrs. Tarte Bros., Taveuni.
Captain Montgomerie, Taveuni.
Messrs. Crompton and Johnson, Savusavu Bay.
Messrs. Spaeth and Niven, Savusavu Bay.
Mr. C. A. Burness, Ra.
Mr. J. F. Burness, Ra.
Mr. G. E. Bannister, Ra.
Mr. H. J. Thomas, Ba.
Mr. R. A. Gale, Ba.
The Colonial Sugar Refining Company, Labasa.
Mr. G. Kiss, Colo East.
Mr. J. C. Doyle, Nadi.
Mr. R. P. Carr, Nadi.
Mr. W. A. Wignall, Lautoka.
The Colonial Sugar Refining Company, Lautoka.
Mr. E. D. Francis, Tavua.
The Headmaster, Queen Victoria School, Nasinu.
Mr. E. A. Kellar, Tailevu.
Mr. A. A. Palmer, Levuka.
Mr. W. B. Stinson, Gau.
Mr. R. B. Howard, Sigatoka.
Mr. J. F. S. Studholme, Qaraniqio.
Captain D. Robbie, Levuka.
Mr. G. A. Towson, Savusavu Bay.
Mr. D. Cameron, Ba.
Mr. S. G. Wotten, Nadi.
Mr. E. Masters, Kadavu.
Messrs. Foulis and Marsh, Tavua.
Honourable J. M. Borron, Cicia.
Lau Provincial School, Lakeba.
Mr. H. H. Steinmetz.
Mr. A. Eyre, Buca Bay.
Mr. N. W. Towson, Savusavu Bay.
Salwey Company, Buca Bay.
Roman Catholic Mission, Tunuloa.
Mr. N. G. Williams, Savusavu Bay.
Levers Pacific Plantation Limited, Rabi.
Mr. W. McPherson, Waikava.
Mr. C. Hutchings, Tailevu.
Mr. M. S. Cooper, Savusavu Bay.
Mr. F. D. Brooks, Labasa.
Mr. M. Lynch, Dreketi.

The receipt of Returns of Stock is hereby acknowledged from the following :

Honourable R. A. Harricks, Nadi.
The Penang Sugar Estate, Ra.
The Vancouver-Fiji Sugar Company, Navua.
Captain Wilson, Levuka.
The Colonial Sugar Refining Company, Nausori.
Messrs. Sunderland and Cotter, Ellington.
Mr. W. E. Macindoe, Ra.
Mr. E. T. Woolcott, Ba.
Mr. C. Wager, Ba.

DEPARTMENTAL NOTES.

Mr. C. H. Wright, M.A., F.I.C., Government Chemist, returned from leave on 13th March,

Captain N. W. Faddy, M.C., Inspector of Produce, was released from military duty and resumed the duties of his office on 10th March.

Mr. H. W. Simmonds, who is engaged upon a mission to Tahiti in connection with the investigation of a parasite for the coconut scale, writes on 2nd March from Wellington, that he expected to leave for Tahiti very shortly. He mentioned having met persons interested in coconut planting in Tahiti, who spoke most highly of the beneficial work of the parasite, and even indicated the possibility of there being difficulty in finding extensive patches of the scales.

The attention of banana shippers is again called to the necessity for complying with the regulation requiring fruit offered for export to be fumigated. Failure to comply with this regulation will cause considerable trouble to shippers during the loading of the fruit and may lead to the rejection of all the fruit which has not been fumigated.

The requirements of the New Zealand authorities as regard to banana cases are that the cases shall be new and clean. Complaints have been received as to the quality of some of the cases sent away recently. The attention of shippers has been called to the matter.

Agricultural Associations in Fiji.

THE COUNCIL OF PLANTERS OF FIJI.

Chairman.....MR. J. L. HUNT.

Vice-Chairman.....MR. E. DUNCAN.

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THE CAKAUDROVE COPRA GROWERS' ASSOCIATION.

THE CANE GROWERS' ASSOCIATION OF FIJI (BA AND NADI BRANCHES.)

THE LABASA PLANTERS' ASSOCIATION.

THE SAVUSAVU PLANTERS' ASSOCIATION.

THE SOUTHERN DISTRICTS PLANTERS' ASSOCIATION.

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